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# SEASONAL MOVEMENTS OF ELK IN THE SELWAY RIVER DRAINAGE, IDAHO[1]

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*Abstract:* Seasonal movements of Rocky Mountain elk (*Cervus canadensis*) in the lower 35 miles of the Selway River drainage in Idaho were ascertained by pellet-group counts and 38 aerial surveys over a period of 4 years. Elk followed the retreating snow line but descended to the lower slopes with the first appearance of new growth of grasses, sedges, and forbs. Following this distinct downward trend in April, elk gradually worked upward to the summer range. The advent of herbaceous spring vegetation had a greater effect on elk movements than did artificial salt during April and May. Because of the steep topography of the Selway country, migrations from high mountain meadows to winter range do not exceed 20 miles, and for many elk the distance would not be more than 8 or 10 miles. Fall movements of elk occur not only from higher to lower elevations, but laterally along the lower slopes of the Selway River, both upstream and downstream. On 10 of 25 northside drainages, these fall and winter movements caused concentrations of elk which reached 9.1 animals per 100 acres on some winter ranges.

In connection with the study on "Use of Salt by Elk in Idaho" (Dalke et al. 1965), considerable information was obtained on the fall, winter, and spring movements of elk in the same area as the salt study. Details of location, topography, climate, and plant associations are in the previous article. In this study, Beeman (1957) and Kindel (1958) were concerned largely with migration patterns as ascertained by analysis of pellet-group patterns on selected transects, while Robel (1958) and Williams (1962) determined seasonal movements based largely upon repeated aerial reconnaissance flights.

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## METHODS

### Pellet-group Counts

The pellet-group count was used as one method of measuring the relative rate of elk movement from winter range to summer range. Four belt transects were established along Forest Service access trails on ridges believed to be the principal travel routes of elk during the spring migration. Trails represented the middle of the transects which extended 3 feet on each side. Four transects were continuous from 2,000 feet to 5,000 feet elevation (Dalke et al. 1965). Because of the variability in terrain, the transects were of different length. The Wilderness section transects were only two-thirds as long as those in the Coolwater section. Each transect was stratified into 20 plots, each 100 feet long. Later the plot size was increased to 500 feet. The elevational stratification simplified statistical comparison and analysis by equalizing the number of elevational plots in each transect.

Prior to the first count, all pellet groups were cleared from each transect. Each series of counts was arranged to have a mean date representing the four counts of the particular series. This permitted pooling transect data for comparative purposes from each differentially treated section. The order in which each transect was counted was the same for each series; therefore, 14 days elapsed between successive individual counts and 10 days elapsed between each series of counts. The fecal groups were classified as pellet, coalescent (loose or adherent mass of disc-shaped pellets), amorphous (shapeless fecal mass), pellets with dirt, or coalescent with dirt.

### Direct Ground and Track Counts

The abundance of elk tracks in the transects and direct observation of animals was noted in conjunction with the pellet-group counts in 1956, 1957, and 1958. Visibility was too variable within transects, from one transect to the next, and from one count series to the next to make the elk counting even relatively consistent and reliable. The density of the vegetation varied with elevation and between transects because of the difference in plant composition. Visibility decreased with the increase in vegetational development. Both weather conditions and elk numbers fluctuated widely with time and drainages.

Even though the abundance of tracks did denote the approximate number of elk in a given area, the results were inconsistent from one count series to the next because of changing weather. Because of its low reliability, this indirect method was abandoned in 1959 and 1960.

### Aerial Surveys

In the Selway study, the airplane was the principal means of studying movements of elk. Biweekly flights were made from mid-November, 1957, to mid-June, 1958, and at 10-day intervals during February, March, April, and May of 1959 and 1960. Two types of planes were used, the Super Cub (125 and 150 hp) and the Cessna (172 and 180 hp). A total of 15,453 elk were observed during 132 hours of flying in 38 flights.

Standard elevations were flown consistently during each flight. The higher transects were flown first, others being covered in progressively lower sequence. The intervening tributary drainages were contoured parallel with the major river drainage. The transects were at intervals of 1,000 feet with the exception of those above 4,000 feet, which were dependent on the snowline and the upward elk movement.

During 1959 and 1960, mid- to late-morning hours were flown in February, March, and April. In May, flights were made only during early morning hours.

## RESULTS AND DISCUSSION

### Seasonal Diet Change and Fecal-group Patterns

The changing forms of fecal groups provided information on the dietary changes in the spring and the rate of movement from the winter range to the spring and summer range.

The three major recognizable form classes were pellets, coalescent, and amorphous. All fecal groups prior to early April were in the form of pellets and composed entirely of vegetable matter. The irregular coalescent forms appeared in mid-April. The variation in the advance of spring vegetation was shown by the difference in percentage of coalescent forms. In 1959, only 1 percent of the pellets were coalescent in late April, while almost 33 percent were of this form during the same period of 1960, thus revealing the earlier plant development in the latter year. By mid-May, coalescent groups amounted to 47 percent in 1959 and

78 percent in 1960. The progressive development and abundance of grasses, sedges, and forbs at constantly higher elevations was shown by the corresponding gradual increase in coalescent forms and decrease in pellet forms.

The number of fecal groups counted on the five transects during the 4 years 1957–60, inclusive, were exceedingly variable. Many of the smaller transect counts were insufficient to ascertain reliable distribution by mean elevations. By combining the pellet-group information for 1 month for each transect, the analysis of variance revealed that years, months, and all interactions in which one or both were involved were significant at the 1 percent level (Table 1). An individual comparison between years showed a highly significant difference between 1957–58 and 1959–60. The mean elevations of elk in 1957 and 1958 were 3,450 and 3,510 feet, respectively, based on pellet-group analysis, while the 1959 and 1960 mean elevation of elk were 4,040 and 4,080 feet, respectively. The interaction between years and transects indicated that the elevations at which most of the pellets were found in April or May were not the same over the 4 years.

The Wilderness portion of the study area was analyzed separately since this area was treated with salt in 1959 and 1960 following 3 years without salt treatment (Dalke et al. 1965). The mean elevations of the pellet groups for the early and latter part of April, 1957, were considerably lower than those for April during subsequent years. The 1958 and 1959 mean elevations of pellet groups for April were practically the same, and the 4-year elevational means for May were not significantly different.

Figs. 1 and 2 compare the elevational frequency of the pellet groups for the five count dates in the Coolwater and Wilderness areas during 1959 and 1960. Elk were fairly evenly dispersed over the winter range as late as April. The shift to the higher elevations occurred in May and June.

Table 1. Analysis of variance of elevation means of pellet groups from four transects during the springs of 1957, 1958, 1959, and 1960.

| Source of Variation | Degrees of Freedom | Mean Square | *F*-ratio |
|---|---|---|---|
| Years | 3 | 4,093 | 60.5† |
| 1957 + 1958 vs. 1959 + 1960 | 1 | 12,190 | 181.8† |
| 1957 vs. 1958 | 1 | 58 | 0.9 |
| 1959 vs. 1960 | 1 | 30 | 0.4 |
| Months | 1 | 15,137 | 223.9† |
| Transects | 3 | 239 | 3.5* |
| 23-mile + Glover vs. Fog Mountain + Cupboard | 1 | 286 | 4.6* |
| 23-mile vs. Glover | 1 | 243 | 3.6 |
| Fog Mountain vs. Cupboard | 1 | 188 | 2.8 |
| Years × transects | 9 | 731 | 10.8† |
| Years × months | 3 | 560 | 7.5† |
| Months × transects | 3 | 1,650 | 24.4† |
| Residual | 1,518 | 68 | |
| Total | 1,540 | | |

* Significant at the 5 percent level.
† Significant at the 1 percent level.

Daily elevational movements during early spring were obvious from both abundance of fresh tracks and deposition of fecal groups at all elevations. In 1959 and 1960, 17 and 36 percent, respectively, of the pellet-fecal forms for May were found below 3,500 feet. This dispersion of pellet forms indicated that there was a considerable movement of animals from higher to lower elevations and then a return to the higher level.

During late winter and up to the first of April, altitudinal movements of elk were quite comparable over all sections of the study area. The advent of green herbaceous vegetation at the lower elevations attracted and held elk for the latter half of April. Plant development was noted on all pellet-

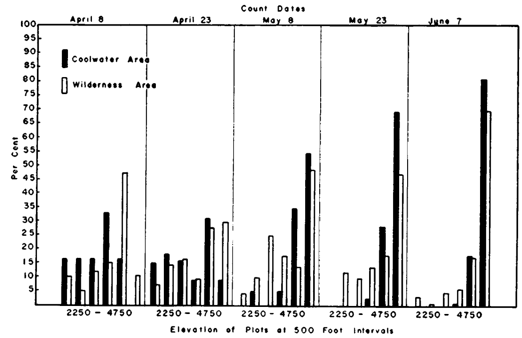


Fig. 1. Elevational frequency distribution of elk fecal groups in two areas of the lower Selway River drainage, spring of 1959.

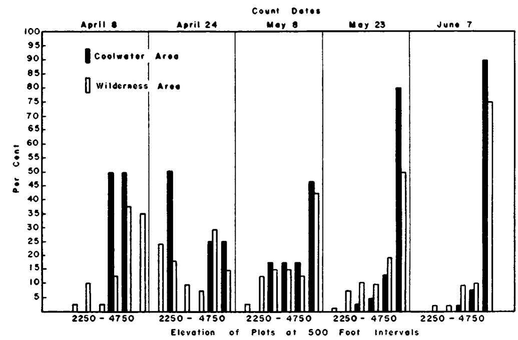


Fig. 2. Elevational frequency distribution of elk fecal groups in two areas of the lower Selway River drainage, spring of 1960.

group transects during the six biweekly count periods from April 8 to May 30. The first signs of leaf growth, and full growth, showed a close relationship with the inception and rapid increase in elks' desire and use of salt at both natural and artificial licks. In 1960, this period was slightly earlier and appeared to be shorter than in 1959. Because of the milder winter and earlier spring in 1960, elk did not have to descend as far to obtain the new spring vegetation (Fig. 3).

Once the elk had started upward toward their summer range, they proceeded at the pace dictated by grass, sedge, and forb development and, thus, upward progress was rather slow (Figs. 1 and 2). The rate of vertical movement per day for the herd was 55 and 30 feet, respectively, for 1959 and 1960, calculated from the aerial counts.

Concentrations of elk on salt grounds became prominent during the upward movement to the summer range. A definite movement to the drainages possessing an abundance of succulent vegetation and salt licks occurred at this time. A large portion of the elk in Gedney Creek drainage shifted west to adjoining Glover Ridge and the West Fork of Gedney Creek. A similar movement occurred in the major drainages west of Three Links Creek toward Stuart Hot Springs natural lick.

The advent of herbaceous spring vegetation had a greater effect on elk movements than did the artificial salt during April and early May. Even in late spring the animals were more abundant in the areas covered predominantly by sedges and grasses. These same open grassy slopes were used as calving grounds.

Statistical analysis of the aerial counts made in the late winter and spring, 1959 and 1960 (Table 2), showed results quite similar to the 1959 and 1960 pellet-group data. Areas, dates, and the interaction of

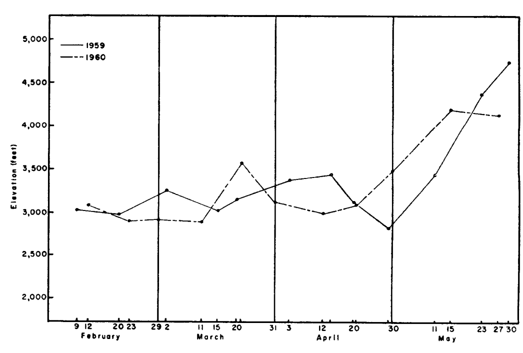


Fig. 3. Late winter and early spring elevational movements of elk in the study area during winter and spring of 1959 and 1960.

years and dates were significant at the 1 percent level. The elevations at which most of the elk were found in late winter and spring were not the same for any 2 years. Fig. 3 shows differences for the last 2 years of the investigation.

Movements of elk in the lower 35 miles of the Selway were relatively short but somwhat complex. In the steep and intricate mountain system of the lower Selway, the fall elk migration was of two kinds. The first migration pattern began to form as elk moved off the high exposed ridges in late September into the lower timbered slopes. These slopes lead directly down to the side drainages above the north side of the Selway River, which constitute the winter range. No distinctive migration was in evidence, but a continual downward trend was noticeable throughout the fall. Interviews with about 500 hunters totaling, 2,858 hunter-hours (Robel 1960) on the study area revealed significant downward elk movements of nearly 1,000 feet during the month of October, 1957.

The second migration pattern as observed in the Wilderness or eastern portion of the study area was typical of the longer elk migrations described by Murie (1951). The initial movements began in late September as elk congregated on the high mountain meadows in the upper Three Links Creek basin and slowly worked their way down Three Links Creek to the Selway River, and thence down river to the vicinity of Pinchot, Cascade, and Ballinger creeks. Total airline mileage for this migration does not exceed 20 miles from the summer range meadows. Elk dispersed over the hillsides and browsed their way to the winter range. A minor migration similar to this second type in the central portion of the study area was noted down Gedney Creek drainage and then east, up the Selway River to the vicinity of Ballinger Creek. A short vertical migration was also apparent from the upper reaches of Ballinger Creek directly downward to the winter range. These migrations resulted in a buildup of elk on the Ballinger and Cascade creeks winter-range portion of this drainage. Many of these elk pass directly by the Ballinger natural licks.

Table 2. Analysis of variance of elevational means derived by aerial surveys of three areas in the lower Selway during the late winter and spring, 1959 and 1960.

| Source of Variation | Degrees of Freedom | Mean Square | *F*-ratio |
|---|---|---|---|
| Years | 1 | 46 | 0.0 |
| Areas | 2 | 513,717 | 20.1† |
| Coolwater vs. Gedney + Wilderness | 1 | 13,889 | 0.5 |
| Coolwater vs. Wilderness | 1 | 161,051 | 6.3* |
| Dates | 10 | 1,003,339 | 39.2† |
| Years × areas | 2 | 61,334 | 2.4 |
| Years × dates | 10 | 251,052 | 9.9† |
| Areas × dates | 20 | 33,139 | 1.3 |
| Residual | 20 | 25,597 | |
| Total | 65 | | |

* Significant at the 5 percent level.
† Significant at the 1 percent level.

During the entire 5-year study period, snow never exceeded 14 inches on the Selway River trail, and the winter range was as high as 4,000 feet from river elevations of 1,400–1,800 feet. Norberg and Trout (1957) reported elk wintering as high as 6,000 feet during the winters of 1954–55, 1955–56, and concentrations in 1956–57 below 4,000 feet were not evident until after mid-February. Because there is considerable elevational difference in the various drainages, the area of available winter range varies. Thus, the concentrations of elk on winter range was extremely variable. Ten of the 25 drainages within the study area showed the following variation in elk per 100 acres of winter range for the late winters of 1959 and 1960 based upon aerial counts:

| Drainage | 1959 Elk per 100 Acres | 1960 Elk per 100 Acres |
|---|---|---|
| Johnson Creek | 0.3 | 0.3 |
| Rackcliff Creek | 0.2 | 0.6 |
| Gedney Creek | | |
| Main Fork | 0.6 | 1.7 |
| West Fork | 0.7 | 2.1 |
| East Fork | 5.7 | 6.6 |
| Renshaw Creek | 2.1 | 2.9 |
| Cupboard Creek | 2.1 | 2.0 |
| Ballinger Creek | 3.5 | 2.6 |
| Cascade Creek | 7.0 | 9.1 |
| Pinchot Creek | 1.3 | 6.3 |
| Average | 2.35 | 3.42. |

Deep snow restricted the elk range to a narrow band in the Selway River canyon where there is little river bottom land.

Sporadic movement patterns during the late winter were largely the effect of inclement weather. Changes from mild to more rigorous weather had an apparent altitudinal dispersing, and often a congregating, effect on elk. A large portion of the animals at the higher elevations usually moved downward below 3,000 feet for the duration of stormy weather. Preceding a change to better weather, most of the elk were found near the snow line. Inclement weather of only a day or two seemed to have no effect on movements. Short movements in winter in the Selway are fairly common. The distance from the top of the winter range at about 4,000 feet to the river at 1,700 feet is only 1.5–2.5 miles.

Differences in late winter movements between the three sections of the study area were due primarily to the steepness of the slopes and to local weather conditions, and only secondarily to the dissimilarity in vegetative density. Vegetational cover seemed to be more sought by elk during warm sunny days, especially in early spring and summer, than during the winter. Elk were much more active during the adverse weather than during periods of mild weather. Many more beds were observed on shrub-covered ridges in deep snow than on timbered areas of little snow. Because many of the dense coniferous timbered ridges have less snow, they were commonly used as avenues for movements from one drainage to another. There may be some attraction to the timber cover during cold rains, but the association is dubious, since most of the animals at the lower elevations, where the timber occurs, were primarily seeking new herbaceous vegetation during early spring rains. During February and March, elk used spur ridges almost exclusively. About 95 percent of the observed population consistently used the spur ridge crests with southerly exposures.

## LITERATURE CITED


Beeman, R. D. 1957. Salt in the management of elk and other wildlife in the lower Selway River area. M.S. Thesis. Univ. Idaho, Moscow. 113pp.

Dalke, P. D., R. D. Beeman, F. J. Kindel, R. J. Robel, and T. R.Williams. 1965. Use of salt by elk in Idaho. J. Wildl. Mgmt. 29(2): 319–332.

Kindel, F. J. 1958. Salt in the management of elk in the lower Selway River drainage, Idaho. M.S. Thesis. Univ. Idaho, Moscow. 115pp.

Murie, O. J. 1951. The elk of North America. The Stackpole Company, Harrisburg, Pennsylvania, and The Wildlife Management Institute, Washington, D. C. 376pp.

Norberg, E. R., and E. Trout. 1957. Clearwater game and range study. Idaho Fish and Game Dept. Fed. Aid in Wildl. Restoration Final Rept. Project W-112-R. xiv + 171 + [110]pp.

Robel, R. J. 1958. Salt as a management tool and migration studies on elk in the lower Selway River drainage of Idaho. M.S. Thesis. Univ. Idaho, Moscow. 107pp.

———. 1960. Detection of elk migration through hunter interviews. J. Wildl. Mgmt. 24(3): 337–338.

Williams, T. R. 1962. The significance of salt and natural licks in elk management. M.S. Thesis. Univ. Idaho, Moscow. 200pp.


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